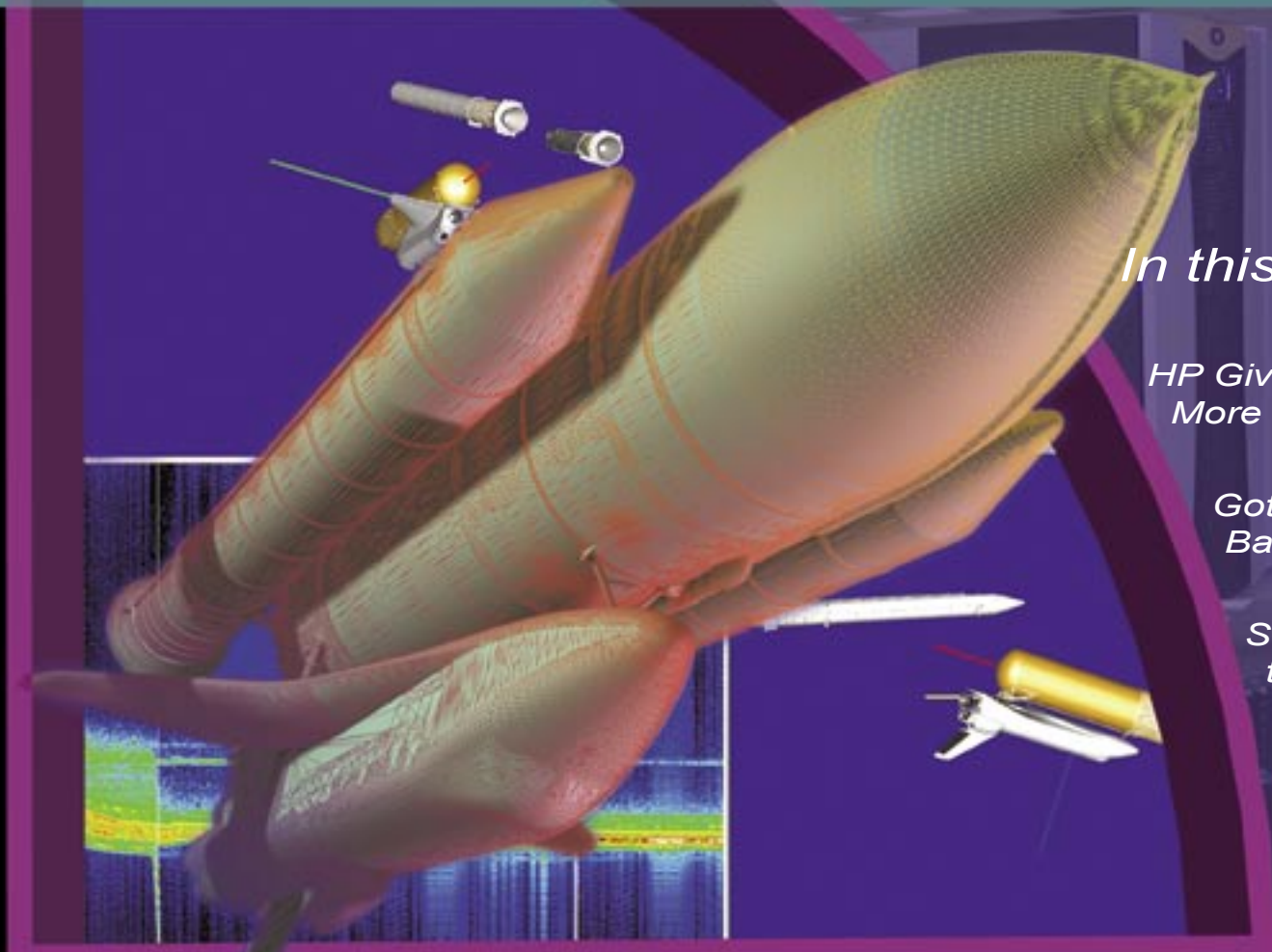
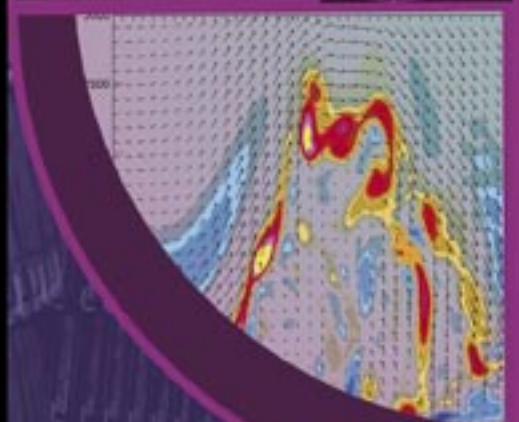
FALL 2005

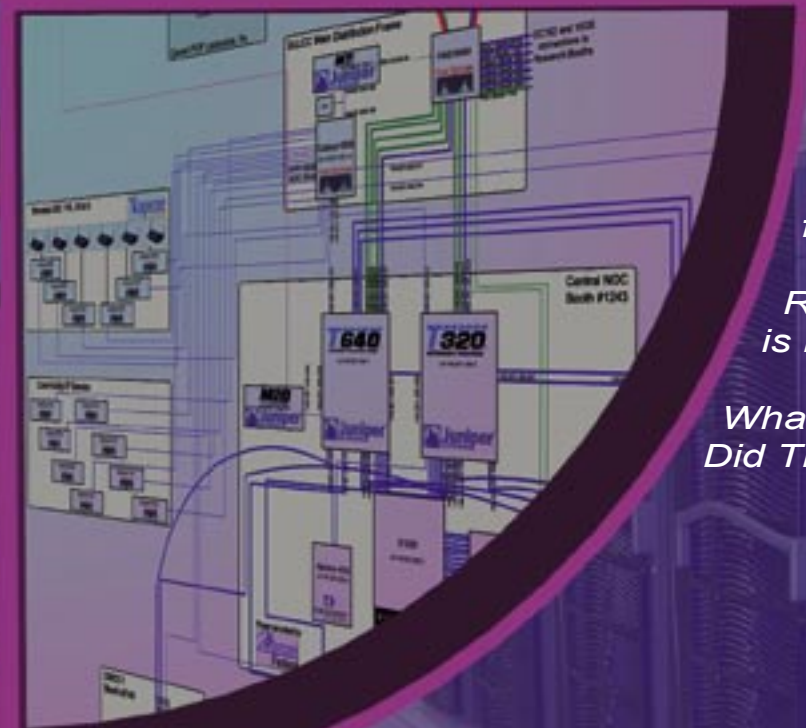
AERONAUTICAL SYSTEMS CENTER

MAJOR SHARED RESOURCE CENTER

Wright Cycles







In this Issue...

Table of Contents

Director's Desk

Powering Tomorrow's Solutions

Welcome to the latest edition of our bi-annual publication, *Wright Cycles*. This issue highlights our HPC systems, infrastructure, and projects, along with the outstanding work being performed by our valued users. I also want to mention the strategic management effort we're expending at the ASC MSRC.

Steven J. Wourms
Director, ASC MSRC

We're working to establish a brand for our MSRC. Our objective is to more easily identify the ASC MSRC and our vision to better enable DoD scientists and engineers to fulfill their vital goals and missions. You already know our logo; we're adding a tagline.

The tagline conveys the notions of: *power* - high-powered systems and personnel conveys a sense of energy and motion; *tomorrow* - supporting DoD S&E in developing emerging systems and technologies; and *solutions* - not limited to a chemical mixture; it's the answers and conclusions we're enabling!

In the Spring issue of *Wright Cycles*, we announced our final piece of the Technology Insertion (TI-05) procurement, a 2048 Opteron processor cluster from HP. This Opteron-based system will nicely complement our new shared-memory Itanium-based Altix from SGI. With the addition of this HP system, the ASC MSRC now has almost 7000 compute processors on the floor, with an aggregate performance of 35 HABUs![1] The feature article on page 2 contains all the details of this newest system.

We are proud to report that this is the eighth consecutive year for the PET-sponsored Summer Intern Program that resulted in 12 engineering and computer science student interns this year. This program continues to provide opportunities for interns that can lead to employment in support of the DoD.

Innovations in HPC technologies and scientific visualization are of continuing interest at the ASC MSRC. The Mach2 and Remote Visualization articles provide prime examples of how collaboration among teams, PET, and other centers of excellence result in innovative approaches to collaborative relationships to serve the user.

A brand new activity is that of Data Intensive Computing Environment (DICE). Funded by a FY05 Congressional Plus-Up, this three-agency consortium involving DoD, DOE and NASA, will evaluate current and emerging data access technologies and their ability to improve data accessibility over geographically distributed sites. The contract was awarded to the Wright Brothers Institute, who selected the Advanced Virtual Engine Test Cell (AVETeC), Inc. to manage the effort.

We highlight reports of several recent Success Stories in this issue. The Coastal Mesoscale Modeling study by Dr. James Doyle and his team from the Naval Research Laboratory provided insight into topographic flows that adversely impact military aviation, military weather forecasting, ground-based operations, and pilot safety. The Space Shuttle Return to Flight study by Dr. Kueichien Hill and her team from the Air Force Research Laboratory Sensors Directorate simulated the signature of the shuttle's ascent to help train radar operators.

You will find a page with Hails and Farewells. Two people with whom I've had the pleasure of working closely with are included in the latter category: Steve Wilson, Infrastructure Management Branch Chief and Cathy Beal, Executive Secretary, will join the ranks of the retired at the end of 2005.

Thank you for taking the time to read this edition of *Wright Cycles*. Our goal is to keep you informed. I invite you to drop a comment to me at asc.hp.outreach@wpafb.af.mil, and tell us how we're doing. I look forward to seeing you in Seattle at SC05!

Steven J. Wourms
Director, ASC MSRC

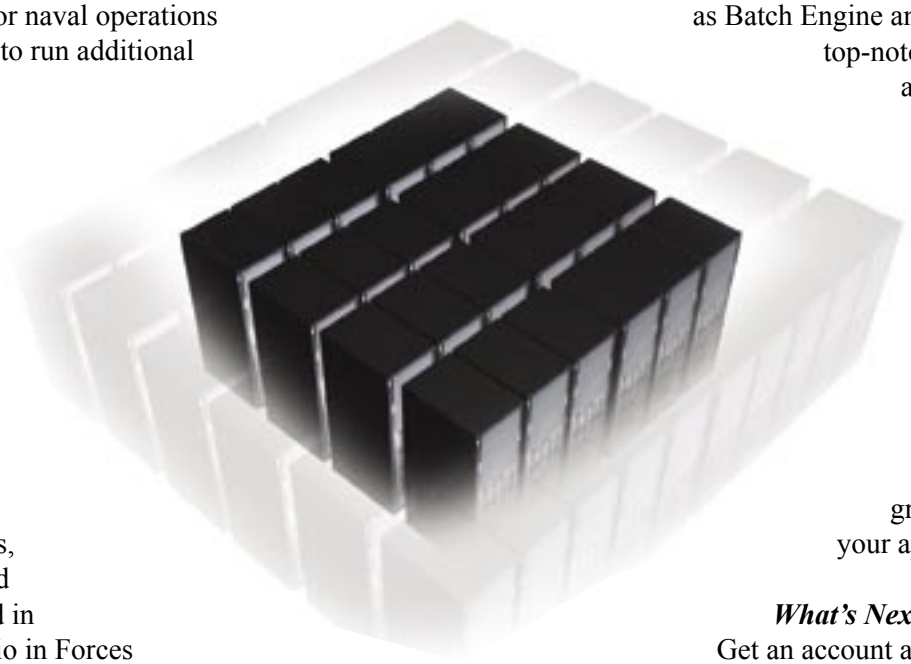
[1]One HABU represents the amount of a representative set of HPCMP workload executed on a 1024P IBM P3.

HP Opteron Arrives at the ASC MSRC

By Jeff Graham

For all of you who read about the new SGI Altix system we recently installed, you know how excited we are about the opportunities that new capability will bring to all of our customers. Imagine 2000 processors of state-of-the-art SGI design all connected to solve your most challenging simulation problems. Well, as they say in the movies, you ain't seen nothing yet.

What if you have used the SGI Altix system, but still are desiring something more. Maybe it is ...more resolution to the grid you are using to run your FLUENT or COBALT software to solve the complex airflow around the new Joint Strike Fighter ...or, more fidelity for your global ocean modeling simulation for naval operations ...or maybe more time to run additional 'what-if' scenarios when developing breakthrough composite materials for laser protection goggles, or perhaps more accuracy in delivering directed energy on target for more lethality and precision in combat or, more soldiers, tanks, trucks, pedestrians, and aircraft moving around in your battlefield scenario in Forces Modeling simulations. Whatever your research, you probably still need MORE! Well, MORE is definitely on the way.



What is It?

The ASC MSRC has another surprise. A second system acquired via the HPCMP-wide FY05 Technology Insertion (TI-05) process is being installed to tackle your most challenging technology problems. As part of the TI-05 process, two major systems were earmarked for a home at the ASC MSRC - the SGI Altix (highlighted in the spring edition of *Wright Cycles*) and the brand new Hewlett-Packard Opteron system. Sporting 2048 2.6 GHz processors, a Linux Operating system, Lustre file system, Voltaire 4X Infiniband interconnect, and 132 terabytes of storage, the new HP system will soon be available to Capability Applications Project (CAP) and allocated users starved for more power.

Will I Like It?

The question that may be on your mind is "Will I like the HP Opteron as much as other systems I have used at ASC in the past?" Our team is committed to bringing in all the Commercial Off-The-Shelf (COTS) software, tools such as Batch Engine and Visual Queue, top-notch Help Desk and application support, as well as on-site PET support to provide the full-service you have come to appreciate from the ASC MSRC. Our staff is diligently integrating all the bells and whistles you need to hit the ground running with your applications.

What's Next?

Get an account and give us a test drive. There is plenty under the hoods of these new systems, just waiting for you to hit the accelerator. Let the ASC MSRC team provide you a seat on our latest gem - the HP Opteron system - today! Call the ASC MSRC Service Center at (888) 677-2272 or (937) 255-1094 or if you have used ASC MSRC resources (or other DoD HPCMP systems) in the past, contact your local Service/Agency Approval Authority (S/AAA) to reserve your seat. What are you waiting for? Let us assist you in Powering Tomorrow's Solutions!

AFRL/IF Partners with ASC MSRC on the Distributed Interactive HPC Testbed

By Brian Schafer

The Air Force Research Laboratory Information Directorate (AFRL/IF) and the ASC MSRC have partnered together in support of the Distributed Interactive HPC Testbed (DIHT). Led by AFRL/IF in Rome, New York, the goal of DIHT is to assess the potential value of providing greater, interactive access to distributed HPC resources across the long term to the DoD Research, Development, Test & Evaluation (RDT&E) community and its contractors. This experimental testbed is implemented on the Defense Research and Engineering Network (DREN) and provides DoD scientists and engineers with interactive capabilities for HPC distributed over a wide geographic area.

During FY05, DIHT resources are being used to investigate and evaluate new capabilities that could be supported by the provision of distributed, interactive HPC resources, enabling new applications with responsiveness measured in seconds or minutes. Potential applications that could benefit from using these resources include the Joint Battlespace Infosphere (JBI), Interactive Parallel MATLAB, SAR and hyperspectral image exploitation, and grid-based collaboration. Another part of the experiment is to also see whether interactive jobs can be run with batch jobs in the background to avoid idle HPC resources.

In support of the DIHT, the ASC MSRC is hosting Mach2, a high performance Linux cluster. The Mach2 system is a 24-node, dual Intel Xeon cluster with 4 GB DRAM and 80 GB disk per node and a gigabit Ethernet (GigEnet) interconnection fabric. This system uses Red Hat Linux Enterprise 3 as its operating system. In addition to systems at AFRL/IF and the ASC MSRC, the DIHT also includes machines at the Army Research Lab MSRC, the Maui High Performance Computing Center, and the Space and Naval Warfare Systems Center, San Diego.

The ASC MSRC is pleased to partner with AFRL/IF in support of the DoD HPC community. We will continue to explore opportunities to form strategic partnerships that benefit the HPCMP and DoD HPC users. For additional information on the DIHT, please contact Christopher Flynn (AFRL/IFTC) at Christopher.Flynn@rl.af.mil.

The Mach2 system, hosted at the ASC MSRC, is supporting the Distributed Interactive HPC Testbed (DIHT).

The author would like to acknowledge the January 2005 Distributed Interactive HPC Testbed Newsletter authored by Dr. Richard Linderman (AFRL/IF), Dr. George Ramseyer (AFRL/IFTC), and Ms. Virginia Ross (AFRL/IFTC), as a source for this article.

IPv6 Update

By Charlotte Coleman

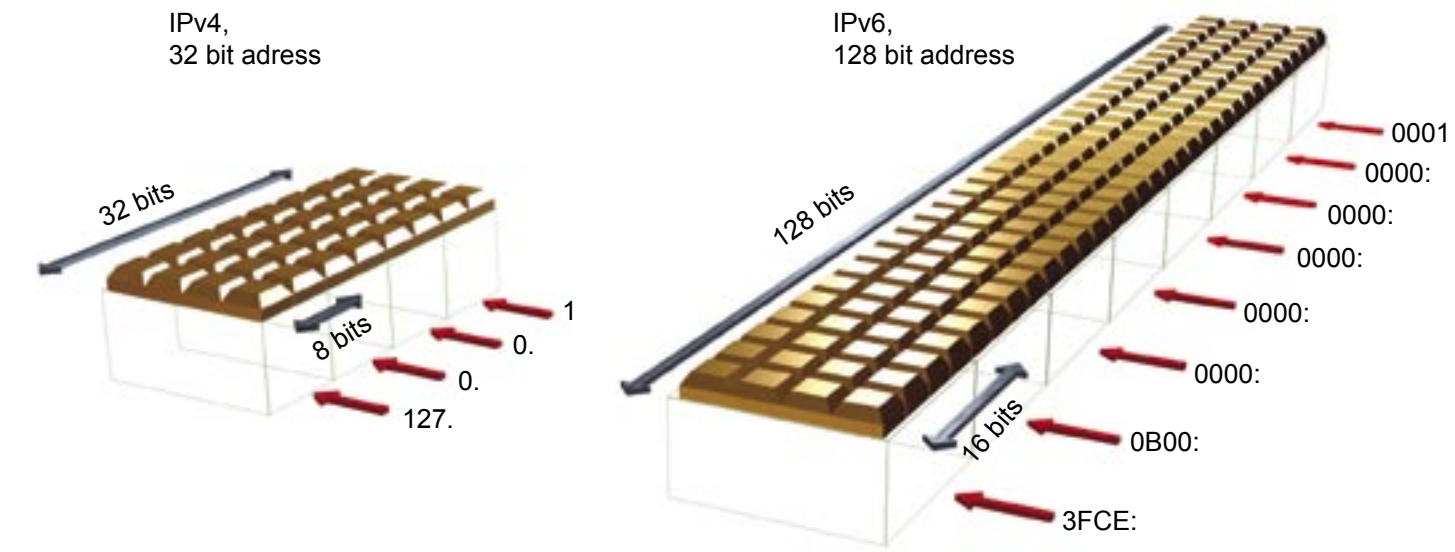
The DoD has established the goal of transitioning all DoD networking from the current Internet Protocol version 4 (IPv4), to the next generation IP version 6 (IPv6), by 2008. Because the DoD IP networking enterprise serves hundreds of thousands of users and impacts the everyday business, tactical, and strategic operations of the DoD/AF, the ASC MSRC has taken a proactive role in contributing to this transition. The Assistant Secretary of Defense Chief Information Officer, the Office of the Secretary of the Air Force Chief Information Officer, the Director of the HPCMP and the Director of the ASC MSRC are committed to supporting the DoD policy for enterprise-wide deployment of IPv6.

Address Shortages on the Horizon

As the number of internet-connected devices increases, the address space of the current IPv4 version of the IP suite on which the internet runs is rapidly being consumed, creating an IPv4 address shortage leading to an eventual exhaustion. The IPv4 address space has 32 bits, limiting it to an absolute maximum of $2^{32} = 4{,}294{,}967{,}296 = 4.294 \times 10^9$ (roughly 4.3 billion) possible addresses. IPv6 is intended to increase that space by a factor of 256 with a new 128-bit standard that will improve service around the globe by supporting about 3.4×10^{38} addresses. The increase in space will eliminate the address limitations and extend IP use, allowing future cell phones and mobile devices to have their own unique and permanent addresses, as shown in the graphic below.

ASC MSRC Supports Effort

To support the IPv6 transition the ASC MSRC has integrated its HPC test and development systems with discrete IPv4 and IPv6 network layers (sometimes referred to as "dual stacked"). Dual stacked hosts run both the current IPv4 standard and the next generation IPv6 standard. This IPv6 test environment will allow the ASC MSRC to test and verify our systems, networks, and software applications for IPv6 compliance.



IPv4: 8-bit bytes = 4 bytes = 4 decimal numbers ranging from 0 to 255 = 32 bits total
Ex. 127.0.0.1, 255.0.128.78 9 (cannot be abbreviated, all four numbers must be provided)

- Last IP address of subnet is broadcast address
- Loopback address is 127.0.0.1

IPv6: 16-bit bytes = 8 bytes = 8 hexadecimal numbers ranging from 0 to FFFF = 128 bits total
Ex. 2FCE:0B00:0000:0000:0000:0000:0000:0001 (can be abbreviated)
2FCE:0B00::0001
2FCE:B00::1

- No broadcast addresses, only multicast
- Loopback address is ::1
- Address are scoped: link-local, site-local, global

IPv6 Steps Up to the Challenge

Since the ASC MSRC has the largest DoD suite of user software, we have accepted the challenge of tracking IPv6 impacts on software applications used by the HPCMP MSRCs and Allocated Distributed Centers (ADCs). An IPv6 Applications Team with representatives from each MSRC and ADC has been formed to facilitate this effort. Identifying, testing, and enabling network dependent, IPv6-enabled applications is the IPv6 Team's #1 focus. The team's focus will expand as more software vendors enable their applications for IPv6 communications. HPC infrastructure applications, third-party user applications, and HPC user-developed applications are being evaluated by the IPv6 Team. Checklists of the IPv6 impact on applications have been created and made available to application developers. The status of each application and any lessons learned will be collected for posting on the DREN IPv6 Knowledge Base website. The IPv6 information collected will be accessible to the DREN and HPCMP communities through a restricted website. For website access contact the HPCMP IPv6 Implementation Manager John Baird at baird@hpcmo.hpc.mil.

IP has become the foundation of interoperability across DoD, enabling today's and tomorrow's "net-ready" operations. In addition to the unlimited address availability, DoD users will benefit from IPv6's improved security, quality of service flexibility, mobility support, and system sustainment.

For more information about IPv6 updates at the ASC MSRC, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

Discovering the World's Fastest Network

By Tracey Wilson

The International Conference for High Performance Computing and Communications, better known as SuperComputing (SC), brings together individuals and organizations associated with HPC from the commercial, research, and academic arenas. This conference provides an opportunity for those gathered to display their wares, share ideas, and promote new advances in HPC technology.

At the heart of the SC conference, resides a high-powered network infrastructure, which provides network connectivity for all the attendees. This infrastructure connects several of the largest research and academic Wide Area Networks (WAN) including: Abilene, ESnet, the Defense Research and Engineering Network (DREN), TeraGrid, and the National Lambda Rail (NLR). This network provides the infrastructure necessary to support HPC application demonstrations requiring large network throughput, including a High Performance Bandwidth Challenge (BWC) competition designed to test the absolute throughput limits over large bandwidth connections. Multiple OC-192 (10 Gigabit per second) circuits are provided to the conference by WAN vendors to meet this daunting bandwidth requirement. The organization responsible for planning, designing, installing, and managing this complicated infrastructure is called SCinet.

Who Represents SCinet?

SCinet's members are some of the leading networking professionals in the world and come from a variety of organizations including: DOE, DoD, several Internet Service Providers (ISP), and from all of the participating networking equipment vendors. Members from the ASC MSRC have been participating in SCinet since the late 1990s and today hold important roles in the planning and implementation of this network infrastructure for each conference.

Planning for SC

Planning for each conference begins more than a year in advance. Teams plan the implementation of routing and switching schemes, WAN connectivity, fiber runs, Help Desk operations, Network Operations Center (NOC) and Distributed NOC (DNOC) designs, wireless connectivity, security, architecture, signs, and vendor equipment participation. The teams meet face-to-face at least three times a year to coordinate their efforts for this large task, as well as continuous interactions during the conference planning period.

How it All Comes Together

Network equipment is setup and pre-staged on-site several weeks before the actual conference. The week before the conference, the SCinet staff works to install all the necessary fiber cable runs and equipment before the vendors and exhibitors arrive for the show. Each year's goal is to have Internet connectivity set up for the booths by Thursday of the setup week. As exhibitors arrive, SCinet personnel help to complete requested connections and to troubleshoot any problems.

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During the conference, SCinet supports the BWC competition for network throughput. Competitors submit proposals for their solution and connection requirements. SCinet works with the evaluation committee to review the proposals, provide the connections, and monitor the throughput performance.

Once the conference is complete, the SCinet staff is responsible for the disassembly of the network, removal of all fiber cables that can be re-used, and organization of the equipment for transport back to the vendors.

How Does SCinet Relate to HPCMP Sites?

The SC conference is a showcase of the latest and greatest technologies not only for HPC, but also for networking. New router, switch, optical network technologies from many of the major network vendors are showcased at the conference. As a member of SCinet, exposure to these technologies and the vendors who support them, gives unique insight into the possible benefits that these devices could bring to an MSRC or DC. Over the past years, new technologies such as 10 Gigabit Ethernet and IPv6 have been showcased on the SCinet network and are now ready for deployment in various sites throughout the HPCMP. High density Gigabit and 10 Gigabit Ethernet switches and large backplane routers have been used for the SCinet network and now add great value to new HPC clusters and DREN connectivity.

Highlights From SC2004

At SC2004, SCinet placed over 10 miles of fiber cabling and used 17 OC-192 (10 Gigabit per second) and 1 OC-48 (2.5 Gigabit per second) connections to different WAN providers. The SCinet network infrastructure included almost 100 wireless AP points configured for 802.11 a, b, and g connectivity and carried nearly 8.28 Exabits or 8.28 x 10^6 Gigabits of IP traffic across the network backbone over the course of the conference.

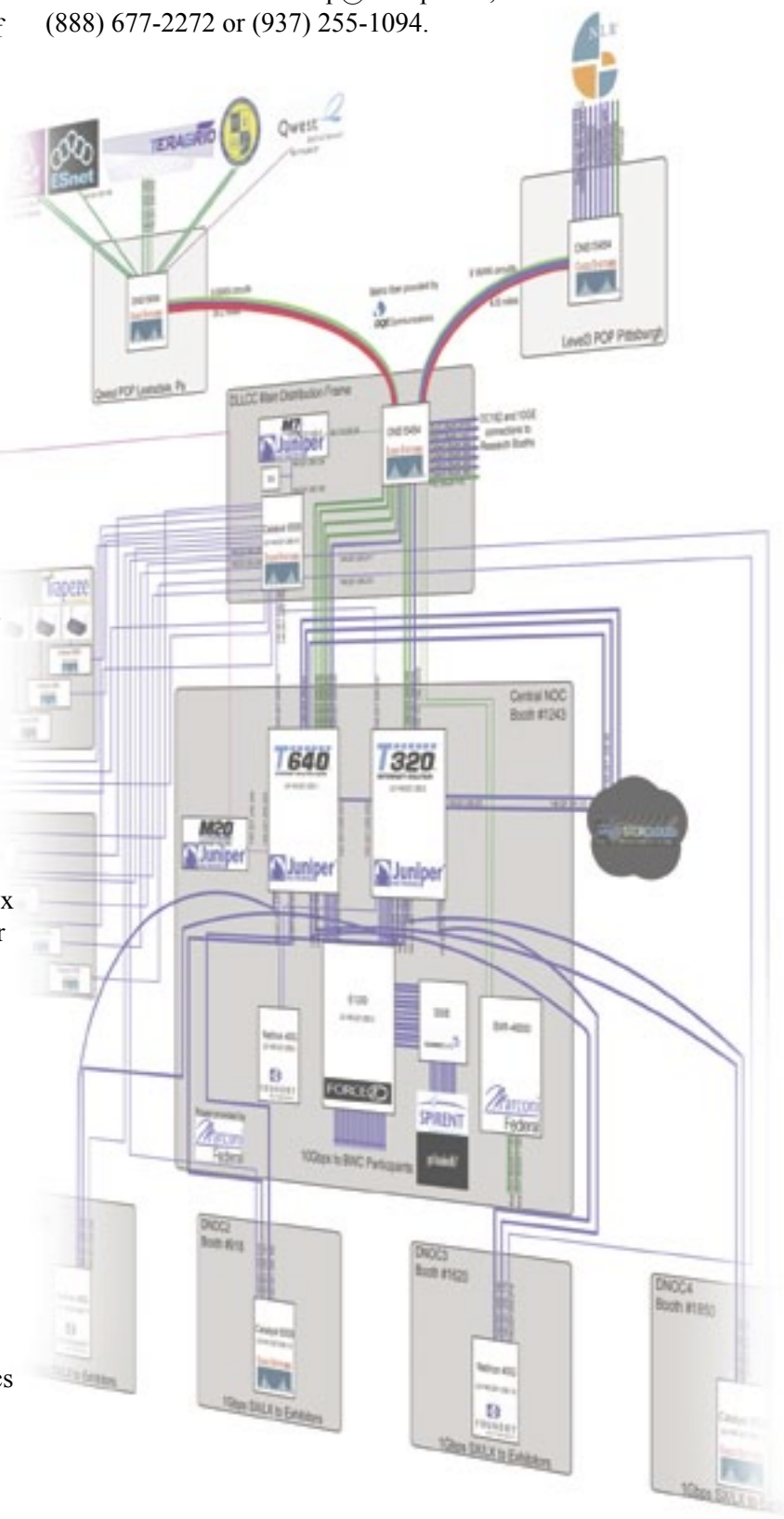
What to Expect in 2005

SCinet plans for SC2005 are nothing short of spectacular. The new infrastructure will include 50+ 10 Gigabit Ethernet and OC-192 WAN circuits and 1 OC-768 (40 Gigabit per second) circuit.

In addition to the normal Gigabit and 10 Gigabit Ethernet connections, SCinet will offer 10 Gigabit per second Infiniband connections. This new Infiniband architecture will allow exhibitors to access StorCloud storage, create grid or cluster demonstrations with other exhibitors or use as the network technology for use in bandwidth or analytics challenge proposals.

SCinet will continue to be a gateway to new discoveries at future SC conferences. The SCinet infrastructure will continue to stand as the forefront to display new network technologies that HPC centers like the ASC MSRC can evaluate and integrate into their infrastructure.

For more information, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.



ASC MSRC Assists NASA with Safety for Discovery Mission

By Dinah Luneke and Gary Sivak

The ASC MSRC continues in its quest of protecting national resources through utilizing critical technologies and expertise in high performance computing. Recently, the ASC MSRC hosted a High Priority Project led by Dr. Kueichien Hill of the Air Force Research Laboratory Sensors Directorate that helped to ensure the safety of the seven astronauts aboard the Space Shuttle Discovery's historical "Return to Flight."

"...the right expertise, the right HPC resources, and the right tools to run"

NASA needed to track the shuttle on radar to record debris that separated from the space craft during the first few critical minutes of turbulent flight through the Earth's atmosphere. Simulated radar data was used to train NASA radar operators to accomplish this important task.

"We had to use HPC resources due to the enormous size of the shuttle target and sheer volume of radar data," research team member Dr. Charles Macon explained. "Due to the tight time schedule of this mission, you can only tackle these types of projects if you have HPC resources available."

"Also, running in high-priority status allowed us to achieve this high throughput in a limited amount of time. We had the right expertise, the right HPC resources, and the right tools to run," according to Dr. Macon.

During the flight, NASA used three strategically positioned debris radar sites to track the shuttle Discovery. The sites scanned the shuttle, including the main external fuel tank and the two solid rocket boosters on either side. Each radar site had a different view of the shuttle, as it was scanned, from the moment of launch, until it achieved earth orbit.

"Although the debris that separated from the Space Shuttle Discovery during lift-off was tracked visually, the research that was done at NASA involved an examination of the radar signature of the debris," explained research team member Dr. Brian Kent of AFRL's Sensors Directorate. "This project's data helped to determine the baseline signature of the shuttle so that dynamic differences between calculated and measured shuttle signatures could be used to spot faint debris separating from the moving shuttle."

Dr. Hill and her team used Xpatch®, a high frequency asymptotic computational electromagnetics code. Known as a "ray tracing" program, Xpatch® simulates electromagnetic radar rays or waves, striking the shuttle. By adding up the

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ASC MSRC Team Shares Spotlight

This high priority project required the efforts of the entire ASC MSRC Team.

Systems and network administrators ensured daily operational readiness of the HPC environment; Operations staff continually monitored the environment, handling after-hour calls, and initiated any immediate corrective action procedures; Database administration staff ensured accurate project allocation and utilization reporting; Web staff ensured technical information and Message of the Day notifications were available and posted; Contracts administration staff ensured non-interruption of service maintenance contracts for key HPC systems; Application managers provided application and direct user support; Accounts Center staff ensured timely processing of project and user accounts; Help Desk staff delivered first call resolutions and service ticket routing and monitoring; Care Coordinator ensured that project-specific needs were being addressed; Outreach staff provided appropriate publicity and exposure of this success story; and the ASC MSRC management provided daily business decisions.

The contributions of each member of the ASC MSRC Team helped to ensure the safety of the crew during the launch of the Space Shuttle Discovery.

rays, the radar scatter field can be determined. Using the scatter field information, the radar cross section or the amount of view available to an observer is obtained. From the radar cross section, the radar signature or distinctively recognizable radar character of the space shuttle, can be calculated. Although approximate, Xpatch® is more than adequate, due to the large electrical size of the shuttle target.

Pictured from left: The first and second photos show the solid rocket booster separation from the shuttle's external tank from two different angles. The range-time-intensity plot with separation phase from NCAR radar is shown in the third photo.

"Part of our mission is to support the vital research of scientists and engineers whose work utilizes the critical technologies and expertise of high performance computing," stated Steve Wourms, director for ASC's Advanced Computational Analysis Directorate. "We, at the ASC MSRC, take special pride in the fact that our organization played a part in helping to provide additional safety measures for the Discovery shuttle - the first successful shuttle flight since 2003's Columbia tragedy."

For more information, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

Air Circulation Modeling Over Steep Coastal Mountains

By Dinah Luneke and Gary Sivak

This high priority project, "Coastal Mesoscale Modeling" was run at ASC MSRC in FY04 by Principal Investigator Dr. James Doyle of the Naval Research Laboratory, Monterey, California.

Wind current flows along mountains including coastal topography, create a phenomena known as rotors and sub-roters, which, if unanticipated by pilots can result in near- or fatal disasters.

Too Much, Too Little, or Just Right

How much resolution in the model is sufficient to represent the key processes? These researchers found the explicit numerical simulation of the small-scale circulations, known as rotors and sub-rotors, are computationally demanding because of the temporal and spatial scales involved. Too large of a scale, and the model lacks fidelity (accuracy and faithfulness to reality). Too small of a scale, the problem is no longer computationally feasible and the researcher is simply wasting precious HPC computer time.

For example, the principle model employed by this project, Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS®) is typically used with a horizontal resolution of 3-9 km on the finest nested grids for operational applications supporting the Navy and DoD. For the research simulations required for this project, Dr. Doyle was interested in temporal scales of six hours or more, and horizontal scales ranging from less than one kilometer to 1,000 kilometers.

"The study of stratified flow over and around topography is one of the classical theoretical problems in atmospheric and oceanic dynamics," Dr. Doyle stated.

Dr. Doyle provides the rationale that mountain waves are thought to have important influence on the atmosphere because:

- The collective effect of mountain-wave drag on the atmospheric general circulation
- Down slope windstorms
- Vertical mixing

- Clear-air turbulence
- Optical turbulence that impacts high-energy laser weapon systems

Forecasting of orographic (topographic) flows remains a challenging problem for Navy and DoD researchers because of their impact on operations in many environments including coastal regions.

The Mountain-rotor Connection

This study investigated the dynamics of rotors forced by three-dimensional topography through a series of high-resolution idealized simulations.

"This type of research simulation can only be performed on large supercomputers, such as those within the DoD HPCMP," Dr. Doyle explained. "A single simulation of a four-hour duration requires approximately 24 hours of computational time using 120 processors on the SGI Origin 3900 at the ASC MSRC. Many simulations can be conducted to explore the sensitivity of the rotor and mountain evolution to changes in the terrain shape and the background atmospheric state, including wind and stability profiles. Thus, the computational resources available from the DoD HPCMP were critical for the success of these simulations, and this project."

Going With the Flow

Vortices, or rotors, represent severe aeronautical hazards due to intense wind shear and have been cited as contributing to numerous aircraft accidents, including occurrences involving modern commercial and military aircraft. This type of phenomena is thought to be common in steep mountainous regions. Topographic effects near a coast impact the weather conditions and make for challenging weather forecasts. Studies include a variety of weather conditions with different coastlines and topography, such as the "Bora" - the cold, strong northeasterly winter wind that occurs on the northern part of the Adriatic Sea, and affects ocean circulation.

Although mountain waves have been intensively studied for decades, relatively little attention has been given to the impact of boundary layer effects on wave dynamics, in part because of the difficulty in treating these processes in a theoretical manner. One important example is the determination of the onset of flow separation, that is, the uncoupling of laminar (boundary layer near surface) flow, and turbulent (distant free wake) flow. This flow separation results in a fundamental change in character of the turbulent flow over an obstacle. Therefore, in spite of their obvious importance, mountain-induced rotors still remain poorly understood, particularly with respect to three-dimensional aspects of the air flow.

Rotating Rotors

This investigation focused on the high-resolution simulation of the internal structure of rotors-circulation flows of air that form on the downwind or leeward side of a mountain. Dr. Doyle focuses on the dynamics of small-scale, extremely strong winds and turbulence produced within rotors that he refers to as sub-rotors, which may be the most hazardous aspect of rotor circulations with respect to aviation safety. Wind shear and its associated aviation problems are well-documented phenomena.

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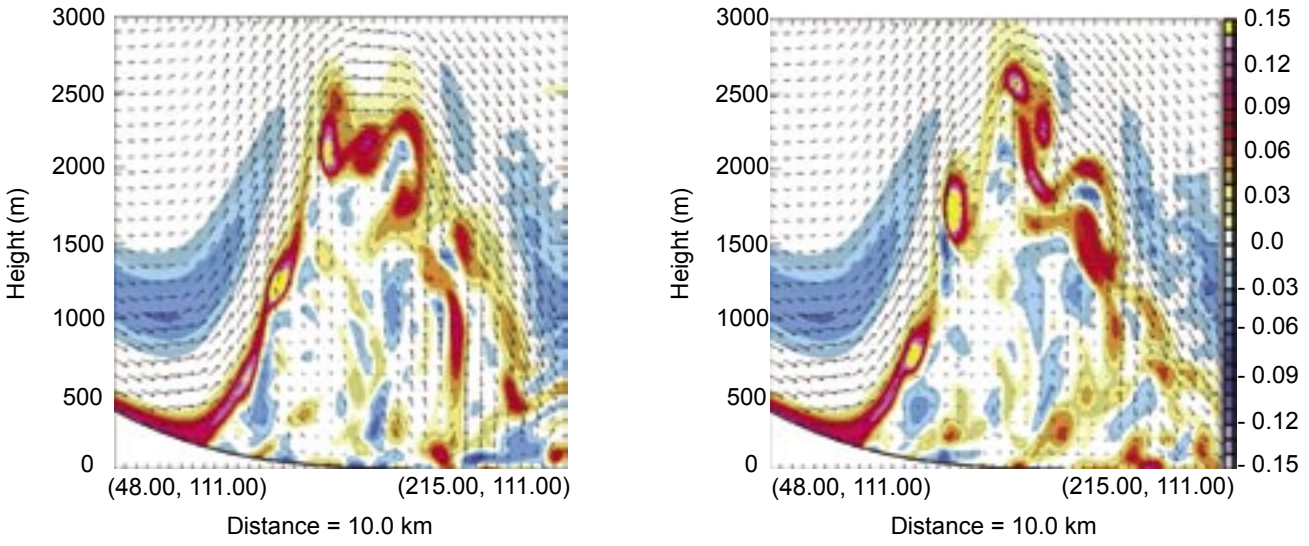

Figure 1. Vertical section of the wind vectors and y-component of the vorticity (color scale, s^{-1}) from grid mesh 5 (Δx=60 m) for the (b) 204 min. and (c) 206 min. simulation times.

The results from Dr. Doyle's research involved a series of high-resolution simulations that indicate that a thin sheet of high-vorticity fluid develops adjacent to the ground along the lee slope, and then ascends abruptly as it is advected into the updraft at the leading edge of the first trapped lee wave. This sheet of vorticity is apparent in the vertical section of the y-component of vorticity and wind vectors shown in Figure 1. In this case, the rotor is a tube of air with its axis parallel to the mountain ridge, such as pointing west to east. The rotor spins, as if it were rolling up the mountain, so the motion of the air flow is always perpendicular to the axis of the mountain.

Figure 2. Mountain wave lenticular clouds, rotor cloud, and blowing dust over the Owens Valley in the lee of the Sierra Nevada (from Robert Symons). The flow is from right to left.

"Mountain waves may be accompanied by severe downslope winds near the surface, occasionally in excess of 50 meters per second, that rapidly decelerate in the lee and flow toward the mountain as part of an intense circulation (Figure 2)," Dr. Doyle said.

In particular a vertical profile approximates the conditions upstream of the Colorado Front Range on 12 UTC (universal time) 3 March 1991. This is a few hours prior to a B737 crash at the Colorado Springs Airport that was initially linked to rotors, near the time when rotor clouds were observed in the vicinity.

Why Study Coastal Wind Currents?

The earth's topography plays an important role in the generation of a multitude of extreme weather phenomena that can adversely impact military operations for the Navy and DoD. Because of the prevalence of hills and mountains included in coastal regions, it is critically important that numerical models, such as COAMPS® accurately predict the weather associated with mountain flows. The results from this study provide insight into the characteristics of intense topographic flows that adversely impact military aviation, military weather forecasting, ground-based operations, and pilot safety.

For more information, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

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"This type of research simulation can only be performed on large supercomputers, such as those within the DoD HPCMP."

Scheduling and Queuing at the ASC MSRC

By Bill Asbury and Jay Blair

The issues of job scheduling and queuing are always at the forefront of any HPC user's list of concerns. Policies and configuration of job scheduling parameters typically drive usage patterns of batch computing systems and can greatly impact user productivity. The optimum solution lies in finding the right balance of Center policies and batch system configuration to meet the diverse workflows and job characteristics of the user community while minimizing overall job queue wait times. By utilizing batch system data, job workflow characteristics, HPCMP guidelines, and cross-center batch system comparisons, the ASC MSRC has implemented changes to accomplish the following: remove constraints for job submission, maintain or exceed job turnaround times, meet critical user computing requirements, and provide an environment for emerging HPC scientific disciplines.

The Queuing Balancing Act

Designing a queue structure is an exercise in balance: the needs of the single user against the needs of the collective user community. At first this may seem to be easily accomplished until the designer is forced to look at user resource requirements at both the micro and macro level. So, how diverse are the typical user workflows and job characteristics? A cursory look at the ASC MSRC's top Computational Technology Areas (CTA) provides great insight into this diversity and highlights the difficulties faced in job scheduling. The Computational Structural Mechanics (CSM) community typically uses 1-4 processors requiring large amounts of memory (>> processors) with wall times of up to a week. On the other hand, the Computational Fluid Dynamics (CFD) community can typically change the problem characteristics in order to scale processor counts from 8 to 512 with memory usage less than 1 GB/processor. The typical wall times for these jobs are one to two days. The Computational Chemistry and Materials Science (CCM) community usually requires 1-32 processors with memory usage less than 1 GB/processor. The typical job wall time is 1-3 weeks due to the large number of calculations required for quantum mechanical analysis.

Establishing Guidelines

The HPCMP has established guidelines for job scheduling and queuing that include:

- Maximum processors for Challenge Jobs less than half of system processors.
- Maximum processors for Regular Jobs less than a quarter of system processors.
- Availability of a debug/test queue with a wall time limit of not less than 15 minutes and a maximum number of processors that will not significantly impact other high-priority jobs.

Expanding to Meet the Need

The HPCMP relative priority of job classes is specified in terms of the expansion factor. The expansion factor is a measure, which factors in the job queue wait time, job execution wall time, and overall utilization of the system. The ideal case occurs when the job queue wait times are zero and results in an expansion factor of one.

Job Class	Target Expansion Factor
Urgent	1.1
Debug	1.5
High Priority/Challenge	1.7
Standard	2.2
Background	--

With these guidelines in mind, an understanding of the CTA workflows, and user comments, the ASC MSRC established a usage policy that provides the user community a greater level of flexibility and simplicity for conducting research and obtaining results. Two innovations at the ASC MSRC have allowed even more flexibility for the user: CPH (number of processors multiplied by the amount of requested wall time) and the LSF "plug-in" scheduler.

From Then to Now

In the past, users had limits placed on the number of requested processors for each job based on many queues with predefined job parameters that the ASC MSRC determined to be the most efficient use of resources. While a user might have need for a 96-processor resource for five days; the queues may have only allowed a 64-processor job for five days. To provide relief from rigid resource definitions, the CPU-hour is now the primary scheduling resource which enabled the standardization and reduction of queue names, greater flexibility in submitting jobs with respect to both number of jobs and number of

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processors, and priority-based scheduling of jobs. Utilizing standard LSF HPC configurations, the ASC MSRC staff automatically maps the five HPCMP job classes to only three distinct queues.

Over the past several years, the ASC MSRC has been gaining ground with the design, implementation, and management of Platform Computing's LSF HPC batch scheduling product. In the course of its daily operations, priority-based scheduling ensures that jobs are re-ordered in the queue based on job priority, instead of a first-in-first-out order. The current ASC MSRC HPC use policy is located on the web at *http://www.asc.hpc.mil/overall/policy_procedure/policies/use_policy.php*.

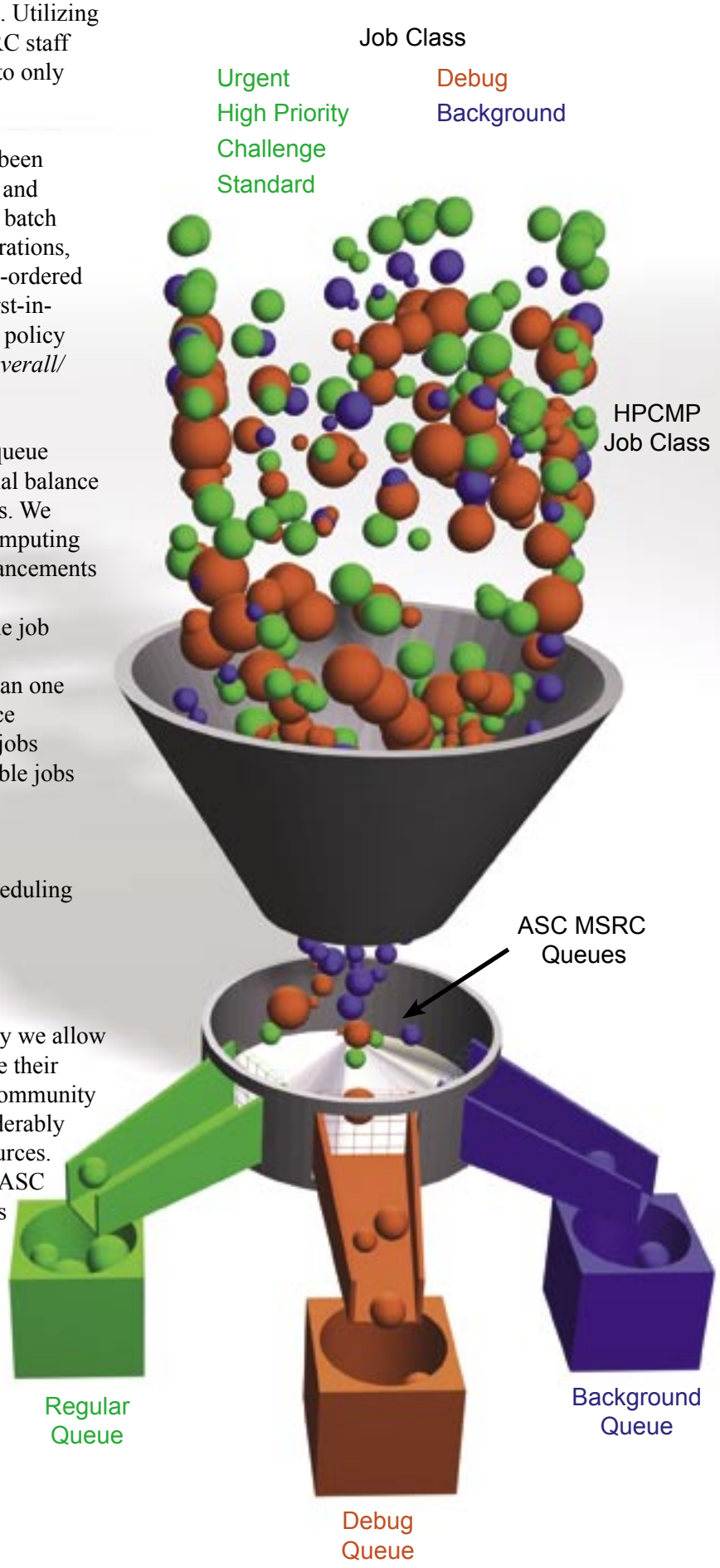
As the ASC MSRC progresses towards optimal queue design and operation, we strive to find that optimal balance in scheduling a diverse set of scientific workloads. We continue to work hand-in-hand with Platform Computing on a list of ASC MSRC requested LSF HPC enhancements including:

- Wait time accrual calculation based on time job eligible to run, not time queued
- Advanced slot reservation depth greater than one
- CPH as a dynamically diminishing resource
- Ability to see priority ordering of eligible jobs
- Separation in listing of eligible and ineligible jobs in queue
- User-viewable backfill window
- Predicted job start time output
- Simulation using historical data to test scheduling rules
- Pre- and post-staging of user data

Summary

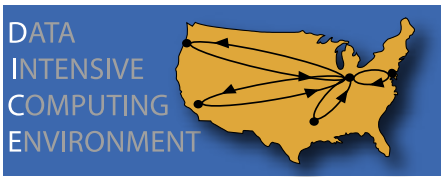
The ASC MSRC is successfully changing the way we allow users to approach their job workflow to maximize their output while minimizing the impact to the user community as a whole. Users are now able to exercise considerably more flexibility in utilizing the ASC MSRC resources. The job scheduling and queuing paradigm at the ASC MSRC has shifted in keeping with what our users expect in terms of availability and extensibility.

For more information about please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or 255-1094.



Data Intensive Computing Environment (DICE) Update

By Roger Panton



In the spring 2005 *Wright Cycles* readers were introduced to the Data Intensive Computing Environment (DICE), a new project being led by the ASC MSRC. As stated in the spring issue, "DICE will consist of a self-contained environment composed of compute, networking, and storage technologies, which is representative of what is found in production HPC centers. The initial DICE configuration will connect these self-contained environments at the ASC MSRC, Ohio Supercomputer Center (OSC) in Springfield, and NASA Goddard via high-speed dedicated networks." The article goes on to say; "The initial activities to be investigated at the three collaborating DICE sites include selected emerging hardware/software data accessibility solutions, and their usability in real-world problems."

Why a DICE Project?

The DICE project was envisioned as a new approach to investigate emerging technology solutions that could improve the "time to solution" of complex engineering and scientific problems. The time to solution is identified as the key metric in the High End Computing Revitalization Tasks Force (HECRTF) report for the high performance computing (HPC) community. (See *http://www.nitrd.gov/pubs/2004_hecrtf/20040702_hecrtf.pdf* for the complete report.)

The amount and size of data files, and the time and difficulty of transferring large files between computers for storage and post processing are known challenges facing HPC users. This data management issue is being recognized throughout the HPC community as a major challenge for HPC users. Several new ideas are being advanced within the HPC vendor community that could improve the data management issue, and reduce the long wait time experienced by many HPC users in locating, transferring, inputting, and post-processing large data sets.

In his research involving gas turbine engine compressor distortion transfer and blade row interactions, Dr. Steve Gorrell (AFRL/PR) has dealt with this data management challenge. In his paper presented at the 2005 HPCMP-sponsored Users Group Conference, Dr. Gorrell pointed out in reference to simulations of an AFRL transonic compressor rig: "Much has been learned regarding the grid resolution required to model unsteady flow features and capture details such as shock propagation and wake shedding and transport. The original grid reported in 2002 was sufficient for use by the steady APNASA code in the analysis and design role. However, it became apparent that a time-accurate TURBO simulation with that grid did not accurately model the wake shedding and transport. At the time of the 2002 simulations, the available computing resources and time to obtain a converged solution were limiting factors. The development of a parallel version of TURBO combined with HPC made more accurate simulations possible. A comparison showing the difference between the 2002 and present simulations is shown in Figures 1 and 2. Each figure is taken at 75 percent span from the three dimensional solution. While the 2002 grid

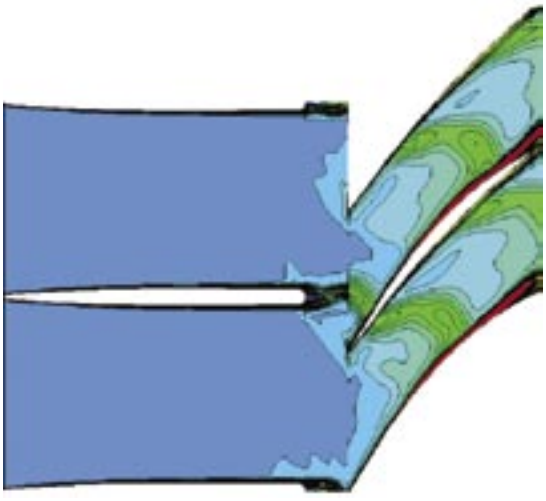


Figure 1. 2002 simulation contours of Entropy

sufficiently captured the inviscid shock features, the denser grid used for the present simulations captured much more of the important details of vortex shedding and transport through the rotor." Dr. Gorrell further states, "Another challenge is the amount of files and large size of the input

continued on next page

and output data files and the very long time it takes to transfer these files between computers for storage and post-processing."

Why a Multi-agency Testbed?

A notable concern is that many of the ideas being advanced by the vendor community are not universal and only work

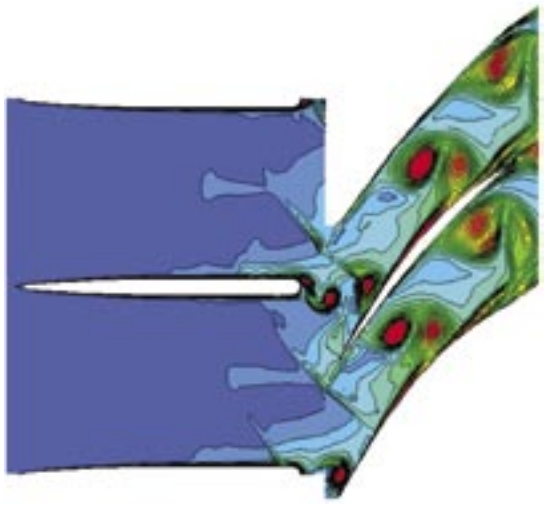


Figure 2. 2005 simulation contours of Entropy

on a specific type of hardware or software. As previously stated, the DICE environment will be representative of Government HPC centers so that evaluations can be conducted that are global in nature. The data management challenge is an universal issue and in the spirit of the Memorandum of Understanding (MOU) between the DoD and the DOE for the Coordination of High-End Computing Activities, a tri-agency testbed environment is being established. The MOU formalizes the coordination and collaboration between the two agencies to ensure maximum impact of Federal investment in the HPC area. The DICE program envisions an environment where the government can evaluate many different products and can identify weaknesses and strengths prior to committing to a given approach. Making the testbed an interagency project brings more emphasis to the data management predicament and will help present to the vendor community the wide extent of the data management concerns.

Contract Awarded

A Collaborative Project Order was issued on 18 July 2005 via AFRL/PK with the Wright Brothers Institute (WBI) for implementing DICE. WBI has issued a sub-recipient agreement for the DICE effort to the Advanced Virtual Engine Test Cell (AVETeC), Inc. of Springfield, Ohio as the Principal Investigator for the DICE project. AVETeC has contracted with Computer Sciences Corporation (CSC) to be the DICE Management and Integration contractor. This partnership, spanning multiple state and federal government agencies, will maximize investment dollars while minimizing gaps and duplication of research efforts.

For more information, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

ASC MSRC Powering Tomorrow's Solutions

Announcing the New ASC MSRC Website

The Fall marks the unveiling of several exciting changes to our website. The site is being redesigned to simplify navigation and provide additional information about our center and its services.

In addition to the redesign, initiatives are underway to deliver new web-based applications that will provide additional services, improving the customer experience. Be sure to check out the new Subscription Service that allows you to order either a printed copy or CD of the current *Wright Cycles*.

The improved site is scheduled to be unveiled in November 2005. Information regarding new web services will be provided as the applications become available.

Do you have suggestions for our website? Send your ideas to webmaster@asc.hpc.mil. For more information, please contact the ASC MSRC Service Center at msrchelp@asc.hpc.mil, or (888) 677-2272 or (937) 255-1094.

For the latest ASC MSRC news visit *www.asc.hpc.mil*.

ASC MSRC Bids Farewell to Long-time Staff Members

By Rich Gestrich and Maria Zimmer

After over 30 years of dedicated civil service, Mr. Steven P. Wilson retires at the end of 2005. For approximately one third of his total career, his work involved managing the operational aspects of the ASC MSRC.

Steve's even temper (Joe Cool attitude) led to the great success of the projects he managed throughout his years at ASC. Even when it's crunch time, Steve follows a cool methodical approach, bringing compromise to problems as they arise. Steve has been instrumental in the planning for the anticipated MILCON project to house the future ASC MSRC. He also played a major role in the Technology Insertions, and served as the lead in updating ASC's building environment to support the ever-growing needs of today's supercomputers.

In his supervisor role, Steve always keeps an open mind to listen to any problems and takes appropriate action to resolve any issues. Steve would never ask someone to do a job that he would not do himself. No one is harder working than Steve Wilson. The ASC MSRC will have a difficult time replacing his diligent work ethic.

Cathy Beal is also retiring in December, completing a 21-year career in the Civil Service. She has worked in various organizations at Wright-Patterson Air Force Base and has been with the Advanced Computational Analysis Directorate, the home of the ASC MSRC, for the past four years as the executive secretary to the Director of ASC/HP. Cathy plans to enjoy life and the great outdoors on her new patio. Her sunny smile will certainly be missed.

All of us at the ASC MSRC wish Steve and Cathy a wonderful retirement.

PET Summer Internship Leads to Full-time Position

Rebecca (Busch) Langdon first came to the ASC MSRC as a part of the PET Summer Intern Program following her freshman year at Ohio Northern University. In both 2001 and 2002, she returned to the ASC MSRC, making her the MSRC's only three-time intern. During her summers at the ASC MSRC, Rebecca worked on several different projects including web-VCR, 3D-virtual tour of the ASC MSRC, and Encrypted Web Information Transfer (EWit).

After earning a master's degree in Computer Science from Miami University, Rebecca accepted a position with Computer Sciences Corporation in the ASC MSRC's Computational Technology Center. In this position she provides application management and user support for a number of Commercial and Government Off-The-Shelf (COTS and GOTS) and Open Source/Freeware applications. Rebecca's primary focus is in the area of Scientific Visualization software.

"During each internship, I was assigned a mentor who guided me throughout the completion of my summer project. As a new employee at the ASC MSRC, I have no single mentor but rather an array of friendly coworkers from whom I can seek advice, support, and encouragement," Rebecca said.

"Rebecca's presence at the ASC MSRC reflects on the successfulness of the PET Summer Intern Program. She brings a fresh approach to problem solving that our users will find very valuable," according to Chuck Abruzzino, Rebecca's mentor during the summer of 2001. The staff at the ASC MSRC welcomes aboard Rebecca as a new team member.

Hails and Farewells

The ASC MSRC welcomes those who have recently filled staff positions.

Bridget Bussell, ASC/HP

Brent Andersen, SGI

Gretchen Smith, ASC/HP

Glenn Wehrer, SGI

Leslie Wilson, CSC

Gary Kedziora, HPTi

Several key personnel have left the ASC MSRC recently. They will be missed.

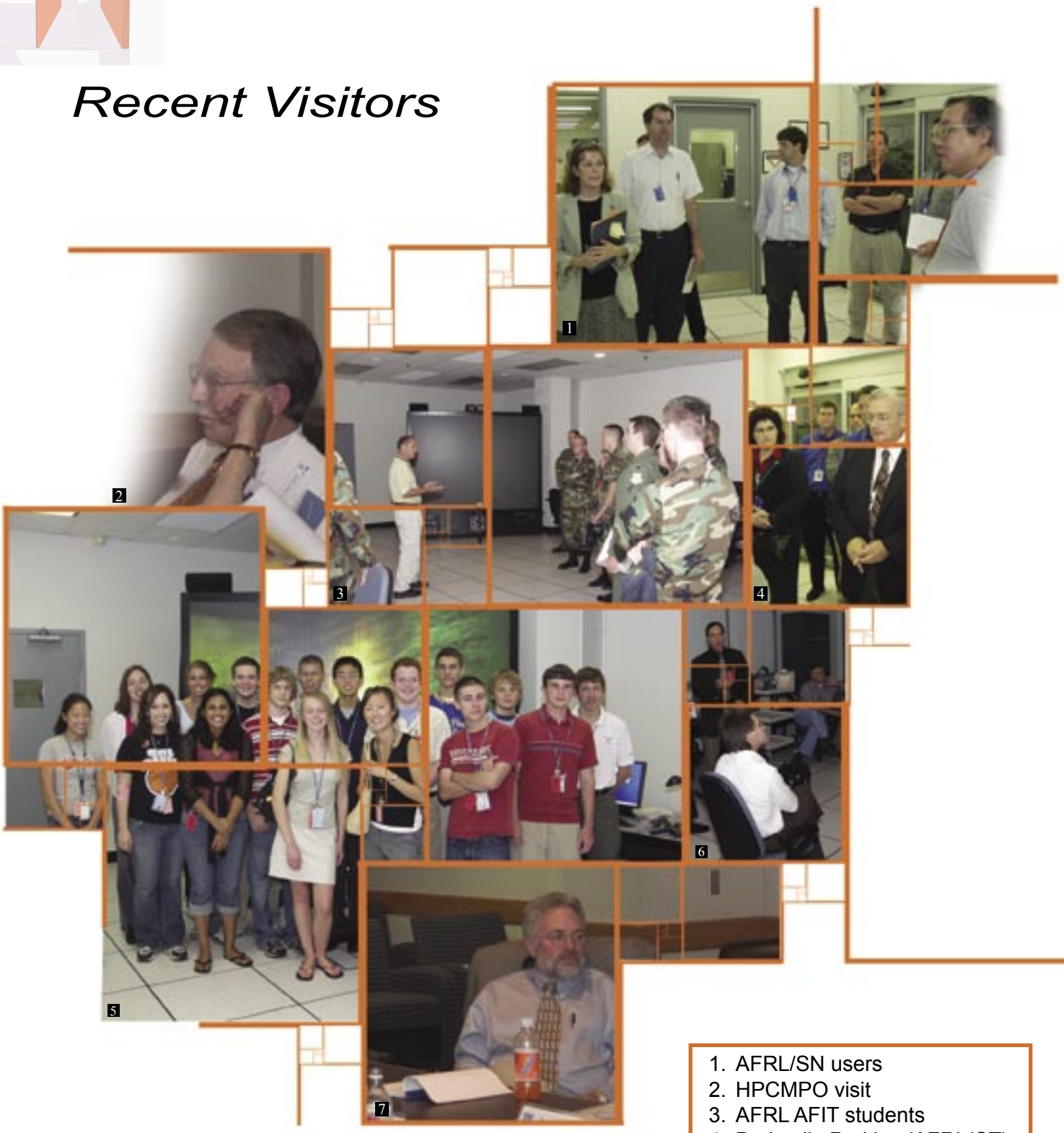
Jean Blaudeau, HPTi

Jonathan Spencer, ASC/HPF

Ryan Cappo, CACI

Steve Eldridge, Abacus

Recent Visitors



1. AFRL/SN users
2. HPCMPO visit
3. AFRL AFIT students
4. Dr. Leslie Perkins (AFRL/CT) and Doug Bowers (AFRL/VA)
5. Wright Scholar Program
6. SciVis Vendor Day
7. HPCMPO visit

ASC MSRC Staff Receive Awards and Recognitions

In June at the 2005 Users Group Conference (UGC), the HPCMPO presented their annual Hero Awards. Nominations were solicited from Government staff at MSRCs and DCs in an effort to recognize deserving staff members. Several ASC MSRC staff were among those nominated in four different categories.

Long Term Sustained Award acknowledges the overall contribution to the S&T and T&E communities because of their contribution to the Program for the last five years. Nominees were Ralph McEldowney and Maria Zimmer, both Government staff.

Technical Excellence Award recognizes those who demonstrate scientific or engineering excellence using HPCMP resources in a creative and effective manner. Open to Government and Contractor (Industry/Academic Partners) in both scientific and networking/security communities. **WINNER:** Jay Blair, CSC contractor staff.

Up and Coming Within the HPCMP Award presented to an individual that has less than two years with the Program and is recognized for making a significant contribution in science or engineering. Nominee: Rachel Crouse, CSC contractor staff.

Innovative Management nominees demonstrate creative business practices to improve overall HPCMP business model. Limited to Government employees. Nominee: Rick Minamyer, Government staff.

Staff recently recognized for Wright-Patterson Air Force Base sponsored awards include:

Ronald Hannan, Government staff
WPAFB Security Management Awards Nominee

Gary Sivak, Government staff
Special Emphasis Programs Achievement Awards
Outstanding Federal Employee with Disabilities Nominee

Maria Zimmer, Government staff, was named the **WINNER** of two Special Emphasis Programs Achievement Awards
On-the-job Achievement Award - Management Category
Outstanding Disability Award - Supervisory Category

UGC 2005

July 27 - July 1
Gaylord Opryland Hotel
Nashville, Tennessee












PET Welcomes New CCM On-Site

By Brian Schafer

The ASC MSRC welcomes Dr. Gary Kedziora as the new PET on-site lead for Computational Chemistry and Material Science (CCM). He is employed by High Performance Technologies, Inc, (HPTi) supporting Dr. Tony Rollett, the PET Functional Area Point of Contact (FAPOC) for CCM.

Dr. Kedziora earned his Ph.D. in Computational Chemistry from The Ohio State University (OSU) in 1994 where he studied accurate first-principal methods for predicting molecular properties. His doctoral dissertation was entitled "The Graphical Unitary Group Approach to Configuration Interaction Calculations: An Application to the Dipole Moment Surface and Potential Energy Surface of the Water Molecule." The outcome of this work was to accurately simulate the low-temperature infra-red spectrum of the water molecule from first-principals.

Prior to receiving his Ph.D., Gary was a research associate in the University of Minnesota's Department of Medicinal Chemistry. He then moved to OSU where he served as a teaching assistant in physical chemistry and general chemistry as part of his Ph.D. program. He also had the opportunity to contribute to the COLUMBUS suite of multi-reference configuration interaction programs, a suite of quantum mechanics programs that are used for accurate and balances simulation of both the ground and excited states of molecules of interest to the DoD.

Upon graduation from OSU, Gary held the postion of a postdoctoral fellow at Argonne National Laboratory, Northwestern University, and the University of Minnesota, extending his background in developing new computational methods for chemistry and biological applications. Research projects included: incorporating relativistic effects into traditional model quantum chemistry, studying the effect of relativity on energetics of chemical interest, extending the popular G3 thermochemical energy prediction method to first-row transition metals, and investigating mixed semi-empirical quantum-mechanical methods for use in modeling chemical bond breaking in macromolecular biological applications.

In 2004, Gary joined HPTi as a consultant where he worked to enhance the capabilities of the COLUMBUS codes, especially the spin-orbit configuration interaction program, for a DoD Technology Transfer contract. As part of this effort, he also greatly improved the user interface to the COLUMBUS programs, making them easily accessible to non-experts. More recently, Gary worked in simulating the electronic structure of carbon nanotubes with induced structural defects in collaboration with researchers at Argonne National Laboratory.

As a PET CCM on-site, Dr. Kedziora is involved with computational tools used to predict basic properties of chemicals and materials, including nano and biomaterials. Properties such as molecular geometries and energies, spectroscopic parameters, intermolecular forces, reaction potential energy surfaces, and mechanical properties, are among those being addressed. Of recent emerging interest in the CCM CTA are methodologies that cover bioinformatics tools, computational biology, and related areas, such as cellular modeling.

Dr. Kedziora can be reached via email at Gary.Kedziora@wpafb.af.mil.

As Gary is coming on board, the PET Team is sad to say good-bye to Dr. Jean Blaudeau, who has served as the PET CCM on-site at the ASC MSRC for five years. Though remaining as an HPTi employee, Jean will relocate to the Army Research Lab Major Shared Resource Center where he will serve as the new PET Component 4 Point of Contact. Prior to joining the on-site PET staff, Jean was a member of the ASC MSRC User Services

group where he also assisted CCM users. We thank Jean for his many years of valuable service at the ASC MSRC and wish him the very best in his new position. Bonne chance, Jean!

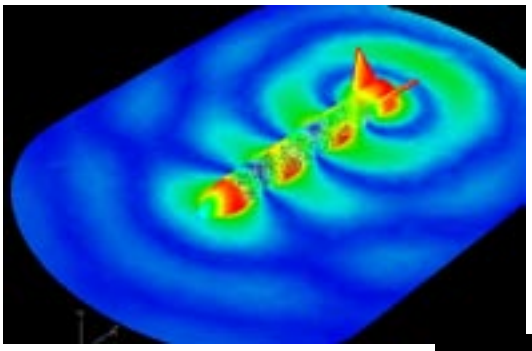
AFRL Users Collaborate Through PET Summer Intern Program

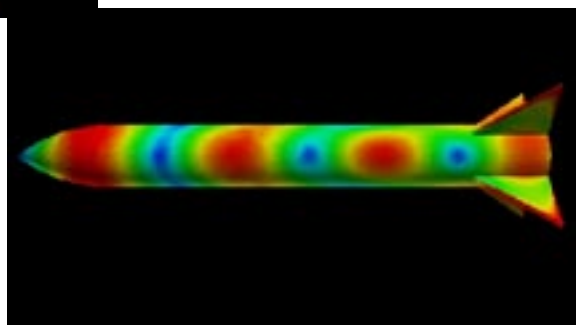
By Drs. José A. Camberos and Steve Wong

Researchers at the Computational Sciences Center, AFRL/VAAC, have developed COBRA, a parallel finite-volume time-domain computational electromagnetics (CEM) solver. For the past two summers, Drs. José Camberos (AFRL/VAAC) and Steve Wong (PET CEA on-site lead at ASC MSRC) have co-mentored PET Summer Intern student Philip Wheat, who is a senior in Aerospace Engineering at Arizona State University.

Summer Intern Philip Wheat performs Verification and Validation (V&V) testing of COBRA in the PET classroom at the ASC MSRC.

The project selected for this internship involved Verification and Validation (V&V) testing of COBRA at the ASC MSRC, as well as development of meshing criteria for COBRA. A number of models were analyzed using COBRA including the EMCC Open Pipe benchmark, X-43 Baseline Hypersonic Vehicle, and Generic Finned Missile. Results from these calculations were validated against available measurements with a high degree of accuracy. In addition, with Computational Electromagnetics (CEA) and Computational Fluid Dynamics (CFD) multi-physics simulation in mind, a first step was also taken in ascertaining the viability of a common geometry grid for use by both COBRA and the CFD code AVUS.





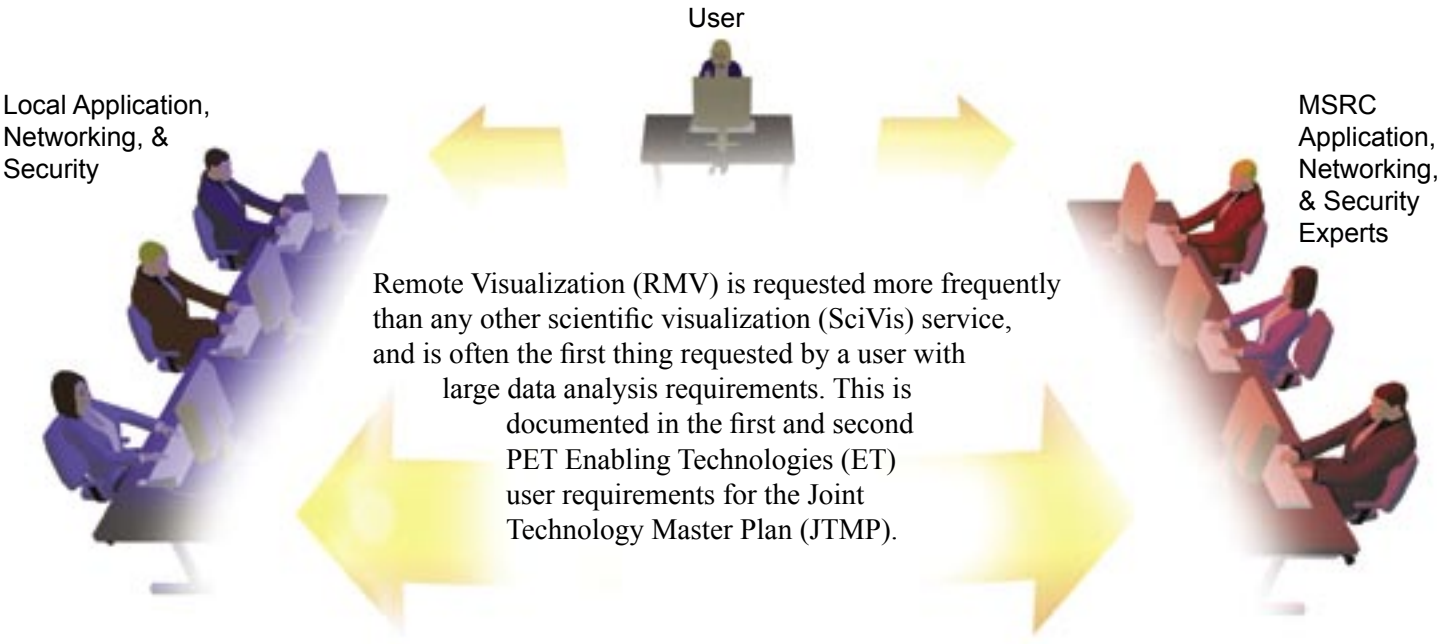
Electromagnetic Scattering (contours of scattered E-field magnitude) from a generic finned missile computed by COBRA.

This collaboration between AFRL/VAAC and the PET Summer Intern Program has produced very fruitful outcomes. Some of the internship project results were summarized in a paper and presented by Mr. Wheat at the 2005 HPCMP-sponsored Users Group Conference held in June. The work from Mr. Wheat's project has contributed to the on-going development of COBRA. In return, the PET Summer Intern Program provided an exceptional educational experience to the student in multidisciplinary research and high performance computing. This is yet another excellent example of the PET Summer Intern Program and the benefits it provides to both DoD researchers and students of computational sciences.

Additional information on the COBRA CEM solver can be obtained by contacting Dr. José Camberos at Jose.Camberos@wpafb.af.mil.

Remote Visualization: What It Could Be in the DoD HPCMP

By Rhonda Vickery



While RMV is technically possible, a unified approach is needed across the DoD to assure successful, efficient, and useful technologies. Addressing these four focus areas would enable RMV to be deployed on a widespread basis:

- Technical
- Security
- Licensing
- Support

Previous articles that have appeared in this publication have discussed the technical areas. This article focuses on the security and support aspects for key RMV technologies.

Security

The most prevalent technology for doing RMV, thus far, uses client-server SciVis applications from the user's desktop system to the data residing at the MSRC. Examples of applications that can be used in this way are EnSight, ParaView, Fieldview, and Presto. Most of these applications require either specific ports opened in the local site firewall, or TCP port forwarding enabled via SSH options. Currently, TCP port forwarding is enabled on at least one machine at each of the MSRCs.

Another effort in this area is to research methods to stream visualization data directly through the SSH port without requiring TCP port forwarding to be enabled, such as remote shell wrappers developed by Sean Ziegeler from the NAVO SciVis lab. Open source packages such as ParaView may be augmented with this technology.

A PET ET project is underway to evaluate the performance of a new product recently renamed from WebVis to ParaView Enterprise Edition (PVEE). The security model of this browser-based product is also under review in collaboration with SciVis and security personnel at several MSRCs.

Remote visualization - visualization for which the data and the display are not on the same machine.

Remote user - anyone who needs to access data that does not reside on their desktop machine.

Successfully deploying RMV technologies requires more collaboration in multiple support areas. The traditional model of a user requesting help from a single application expert is no longer sufficient. Expertise in networking, security, operating system platforms, and specific RMV applications is necessary in order to properly install client software and troubleshoot problems. Some technologies may require additional training and resource coordination for widespread deployment. Version upgrades will need to be scheduled and tested on a coordinated basis to maintain desktop client to HPC data server compatibility.

Widespread deployment of RMV technologies remains a challenging task. Efficient RMV cannot be accomplished without top management commitment and Program-wide collaboration.

In order for RMV to be successfully deployed and supported, consider the following recommendations:

- Establish the proper environment to encourage MSRC labs to collaborate and incorporate the best RMV technologies.
- Establish the correct priority for RMV in the context of visualization services and computer security.
- Establish a baseline level of service for visualization so that RMV can be supported.
- Identify RMV experts at each site for planning, deployment, and support services.
- Bridge the gap between visualization and security to achieve high performance visual data analysis in a secure environment.

Follow-through is essential in order to provide a positive environment for RMV services.

What Can You Do?

There are several things that you can do to help in the deployment of RMV technologies:

- Identify possible technologies to try at your site.
- Establish a team of local experts to support installation and support of RMV technologies that includes system administrators, security personnel, networking experts, and application experts.
- Be willing to work past the initial obstacles to determine which technologies are best for your situation, as well as identify beta testers for new technologies.

For More Information:

Related UGC 2005 SciVis technology presentations:
Online Knowledge Center (OKC) at *https://okc.erdc.hpc.mil*, ET ► Papers/Pubs.

TCP port forwarding, EnSight, ParaView, and WebVis:
https://okc.erdc.hpc.mil, ET ► Tools.

Contact Information:

Rhonda Vickery, ET on-site at the ASC MSRC
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Rick Schumeyer, ET on-site at the ARL MSRC
rschumeyer@arl.army.mil
Robert Moorhead, Functional Area POC
rjm@gri.msstate.edu

MSRC Help Desks: msrchelp@{arl,asc,erdc,navo}.hpc.mil

ASC MSRC Hosts PET Summer Interns

By Katherine Rath

For the eighth consecutive year, the staff at the ASC MSRC has hosted a group of college students participating in the PET Summer Intern Program. These 12 engineering and computer science students came from schools throughout the United States for the opportunity to work with the PET on-site leads and the ASC MSRC team. The students were chosen by their mentors from a very competitive applicant pool and were assigned a project to work on that allowed for hands-on research in their chosen field of study.

One student, Clinton Smith, a senior majoring in Mechanical Engineering at Arizona State University, worked with Dr. Steven Wong, Computational Electromagnetics and Acoustics (CEA) on-site lead, on a computer-aided design code ACAD and produced a Quick Start guide for ACAD. Dr. Wong said that Smith "became a resident expert on ACAD" during his ten-week internship and made substantive contributions in a short period of time. "We hope that this guide will benefit first time DoD users of ACAD at the MSRCs in navigating some of the intricacies in learning to use this software," explained Dr. Wong.

The students came into the program with a wide range of experience. Two of the students, Tanner Suttles and Marcus Gualtieri, had just completed their freshman year at their respective universities. Both students impressed their mentors with the speed at which they were able to pick up and complete their assigned projects. Of his student, Dr. Scott Kajihara (Application Manager, ASC MSRC) had this to say, "(Marcus) managed to learn three scripting languages and one markup language more quickly than I had expected. He also grasped the nature of the taskings to formulate a solution." Gualtieri, a student at the Florida

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Institute of Technology, worked with Dr. Kajihara on automating redundant tasks for the HPC user. Suttles, who attends Purdue University, worked with Dr. John Nehrbass, Signal Image Processing (SIP) on-site lead, on a program designed to automate batch job submissions by using a graphical user interface. Dr. Nehrbass was impressed with Suttles' speed and enthusiasm: "I kept giving Tanner more and more difficult tasks to do expecting him to take longer to finish each task. In fact, he only became more energized and built on past knowledge to deliver. By the end of the ten weeks, Tanner was a valuable resource. We are looking at retaining him in the fall to help increase our productivity."

Three of the students were returning for their second year as interns at the ASC MSRC, and two were working on advanced degrees. Jeff Litzler is working on his Doctorate in Computational Fluid Dynamics (CFD) at the University of Cincinnati. He spent his internship working on a preliminary study of leading edge cooling hole physics for turbine application. Dr. Hugh Thornburg, CFD on-site lead, was his mentor this summer. Jeff described his internship as "one of the best in my professional and educational life."

Front row, left to right: Marcus Gualtieri, Software Engineering, Florida Institute of Technology; Steven Pinsky, Electronic & Computer Technology, Bowling Green State University; Jeff Litzler, Electronic & Computer Technology, University of Cincinnati; Tanner Suttles, Mechanical Engineering, Purdue University; Danny Brenner, Mechanical Engineering, Florida International University. Back row, left to right: Clint Smith, Mechanical Engineering, Arizona State University; Philip Wheat, Aerospace Engineering, Arizona State University; Ryan Osterday, Aeronautical Engineering, The Ohio State University; Andrew Wailes,Computer Engineering, Cedarville University; Ben Johnson, Engineering, Mercer University; James Walker, Computer Science/ Computer Engineering, North Carolina State University. Not pictured Ryan Glasby, Computer Science, University of Dayton.

The internship program has proven to be mutually beneficial to mentors, DoD researchers, and students of computational sciences. For the second consecutive year, Dr. José Camberos (AFRL/VA) and Dr. Wong have worked with Philip Wheat, an Aerospace Engineering student from Arizona State University. According to Dr. Wong, "I think his (Wheat's) internship with PET has broadened his interests and he is now seeking to pursue graduate studies in computational fluid dynamics. It is gratifying that our internship program has made a positive impact on an aspiring astronaut as well as our users' research at AFRL." (See related article on Page 21.)

At the end of their ten-week appointment, each of the interns gave a final presentation on their accomplishments to the ASC MSRC staff and users, which detailed the work that they had done along with the benefits the work would have to the DoD. These presentations were captured and will soon be available for viewing on the PET OKC website (*https://okc.erdc.hpc.mil/index.jsp*).

Students interested in pursuing a PET summer internship in 2006 should contact Katherine Rath at katherine.rath@wpafb.af.mil or Bill Zilliox at william.zilliox@wpafb.af.mil.

Upcoming Conferences

November 12 - 18, 2005
Supercomputing Conference 2005
Washington State Convention and Trade Center
Seattle, Washington
www.sc05.supercomputing.org

November 28 - December 1, 2005
Interservice/Industry Training, Simulation & Education Conference (I/ITSEC)
Orange County Convention Center
Orlando, Florida
www.iitsec.org

November 28 - December 2, 2005
Materials Research Society (MRS) Fall Meeting
Hynes Convention Center
Sheraton Boston Hotel
Boston, Massachusetts
www.mrs.org

December 12 - 15, 2005
The International Test and Evaluation Association (ITEA) Modeling & Simulation Workshop
Hilton Hotel
Las Cruces, New Mexico
www.itea.org

January 9 - 12, 2006
44th American Institute of Aeronautics & Astronautics (AIAA) Aerospace Sciences Meeting and Exhibit
Reno Hilton
Reno, Nevada
www.aiaa.org

March 28 - 30, 2006
High Performance Computing and Communications Conference (HPCC)
Hyatt Regency
Newport, Rhode Island
www.hpcc-usa.org

April 10 - 12, 2006
HPC User Forum Meeting
Richmond, Virginia
www.hpcuserforum.com

June 26 - 30, 2006
DoD Users Group Conference
Denver, Colorado
www.hpcmo.hpc.mil

Wright Cycles
Fall 2005

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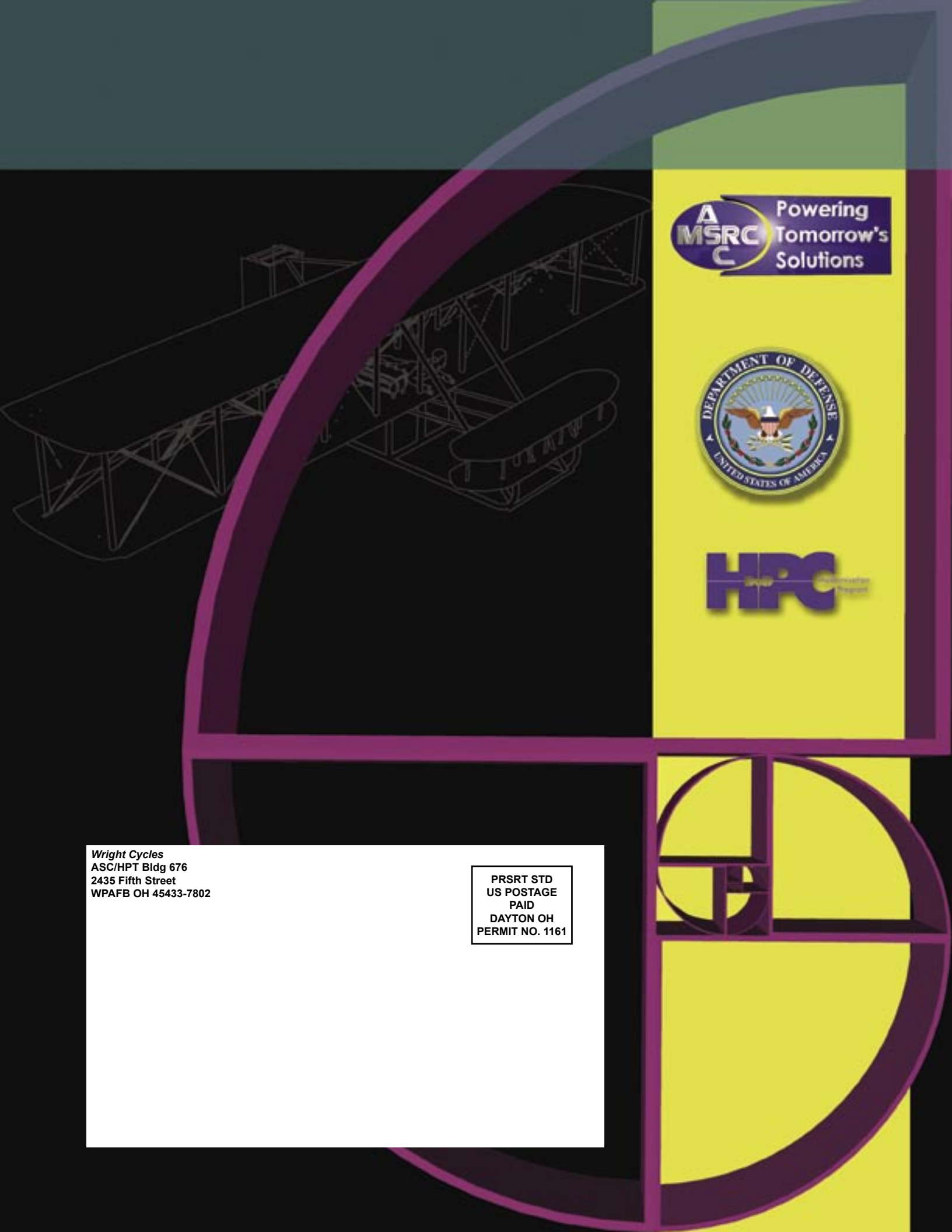

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